

REMARKS/ARGUMENTS

Claims 1-25 are pending in the present application. Claims 5, 6, 9, 14 and 17 have been noted as allowable subject matter. Claim 5 has been rewritten as independent Claim 1 including all of the limitations of Claim 1 and intervening Claim 4. Claims 6 and 11 have been amended. Claims 2, 3, 6, 7, 10, 11, 12, 15, 18, 19, 22 and 23 depend off of allowable Claim 1 or an allowable intermediate claim depending off of allowable Claim 1. Claims 4, 5, 8, 9, 13, 14, 16, 17, 20, 21, 24, and 24 have been cancelled.

With respect to reference numeral 121, Applicants note that reference numeral 121 refers to exhaust stream 121 from heat exchanger 57. Refer, for example, to the specification at page 14, lines 12-13.

Replacement drawings are enclosed. At the Examiner's suggestion, FIG. 1 has been amended to list the embodiments of FIGS. 2-4 in block 30 of FIG. 1. At the Examiner's suggestion, Applicants have shown oxygen enrichment devices of FIGS. 5 and 6 upstream of the engine 30 in FIG. 1 for clarity. The engine 30 may comprise, for example, an internal combustion engine, a spark ignition internal combustion engine, a compression ignition internal combustion engine, a free piston gas generator, or an extremely rich inlet turbo-generator system. The engines may include rich homogenous charge compression ignition in addition to one or more oxygen enrichment devices to further optimize production of hydrogen rich engine exhaust. See the instant specification, for example, at page 4, lines 28-31, page 5, lines 1-7, and at page 16, lines 14-26. FIGS. 2-4 illustrate various embodiments of an engine 30 configured to produce a hydrogen rich engine exhaust. FIGS. 5 and 6 illustrate two possible embodiments of oxygen enrichment devices that can be employed to further optimize production of hydrogen rich engine exhaust. For example, engine 30 may be the free piston gas

generator with super rich homogenous charge compression ignition of FIG. 2, the rich internal combustion engine cylinder system with an oxygen generator of FIG. 3, or the extremely rich inlet turbo-generator system with exhaust heat recovery of FIG. 4. The engine 30 may further employ an oxygen enrichment device for producing an oxygen rich stream to enhance rich combustion in all or part of an engine 30 to enhance production of the hydrogen rich engine exhaust. Examples of oxygen enrichment devices include the oxygen separators shown in FIGS. 5 and 6.

With respect to the heat exchanger shown in FIG. 4, FIG. 4 shows one possible embodiment for the rich engine 30 wherein the rich engine is an extremely rich inlet turbo-generator system 400 with exhaust heat recovery to provide a hydrogen rich engine exhaust to feed the SOFC. Preheated air 59, which may be provided, for example, by heat exchanger 57, is compressed in compressor 402 and fed into rich combustor 404, where it reacts to power high speed turbo-generator 406 having shaft 408 and turbine 410, producing hydrogen rich exhaust 50. The hydrogen rich exhaust 50 is then used to feed the SOFC 40 of FIG. 1. For simplification, FIG. 4 is partially broken to focus on the rich inlet turbo-generator system 400 employed in the system of FIG. 1 with dashed line between the reference 50 and the heat exchanger 57 in place of the SOFC 40 and other devices, such as water shift device 60 and catalyst 90, etc.

FIG. 2 illustrates an embodiment of the invention wherein the rich engine 30 is a free piston gas generator with homogenous charge compression ignition (HCCI). That is, the free piston gas generator with rich HCCI of FIG. 2 is the particular type of engine and is plugged into FIG. 1 as the engine 30. In this embodiment of the invention, the engine 30 is the free piston gas generator 200 and does not refer to an engine and a free piston gas generator as two separate devices employed together. The SAE paper 98FL-386 is background information describing ultra lean combustion, which is not what the present inventors are doing. Rich homogenous charge compression ignition (HCCI) is disclosed

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in the specification at page 10, lines 4-26, page 11, lines 1-3, and page 16, lines 18-23, for example.

The Examiner is further referred to Applicants' Amendments in the parent case Serial Number 10/387,663, now U.S. Patent 6,915,869.

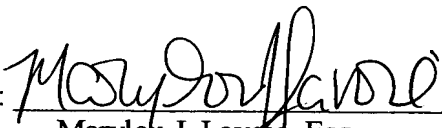
With respect to Claim 11, Applicants do not see the objected to language "and combinations thereof" noted on page 8, paragraph 16 (B) in Claim 11.

Based upon the remarks presented herein, the application has been placed in condition for allowance. As a result, Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Should the Examiner have any questions regarding this matter, the Examiner is requested to contact Mr. Paul L. Marshall, who may be reached in the Troy, Michigan area at (248) 813-1240.

If there are any additional charges with respect to this Response or otherwise, please charge them to Deposit Account No. 50-0831 maintained by Applicants' attorney.

Respectfully submitted,
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